

SYNTAX

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PRINTER WITH MINI-INTERFACE

CAI has introduced a stand-alone printer with a mini-interface for the ZX/TS computer. It works only with 16K and is \$139.95. CAI Instruments, PO Box 2032, Midland, MI 48640.

SYNTAX QUARTERLY DEBUTS

Syntax Quarterly debuted at the Northeast Computer Show, Boston, in Nov. SQ offers in-depth hardware and application stories, reviews and programming techniques. Several other distributors and manufacturers of Timex Sinclair computer products exhibited.

All SYNTAX subscribers as of Dec. 31 will get the first issue of SQ free. You can add SQ to your SYNTAX subscription for only \$10. The regular SQ subscription rate is \$15 for one year; a combination subscription is \$39.

GLADSTONE ELECTRONICS ANNOUNCES NEW PRODUCTS

ZXFORTH, the long-awaited language, is now in N. America. According to Gladstone Electronics, ZXFORTH will go to back-ordered customers end of Nov. Shipments were held up for a manual rewrite. Price: \$29.95.

Gladstone also offers International Publishing Software's new Fast Load program to load and save four or six times faster than normal (selectable). Four times (1000 baud) is 100% reliable; six times (1500 baud) is less reliable with some recorders. Gladstone will sell Fast Load separately and add it to some other programs they sell. Fast Load is not useable with programs storing changeable data. Price: \$19.95 US, \$24.95 Canadian.

Gladstone's new Speech Pack plugs into the ZX/TS rear connector. Its male voice speaks 71 words under software control. Three more ROMs provide 71 more words each. \$119.95 US. Gladstone Electronics, 1585 Kenmore Ave., Buffalo, NY 14217, or 1736 Avenue Rd., Toronto M5M 3Y7.

NEW PRODUCTS AND SERVICES

End edge connector tarnish problems--electroplate the fingers with 24K gold. SASE for details before sending your unit. \$5 plus \$3 (P&H). Matthew Zenkar, 142 Holcroft Rd., Rochester, NY 14162.

Best Computer Coach takes novices through the basics and buzz words of micros. Includes program and audio instruction tape. 16K required, \$19.95. Boston Electronics Systems Training, 1420 Providence Highway, Norwood, MA 02062, 617/769-6867 or 846-9245.

Winky Board II SAVE filter system cuts 16K RAM interference while SAVEing. Assembled and tested \$24, kit \$18, ppd. Earphone add \$1. LOADED into your computer, the Keyboard cassette program saves subsequent programs. \$10, ppd. G. Russell-Electronics, RD1, Box 539, Centre Hall, PA 16828.

New ZX/TS owners: yearly maintenance agreements including full service and all parts. Agreements also for ZX/TS computers no longer under original warranty. Customer Service Dept., MicroSync Services, 162 Marlboro St., Keene, NH 03431.

Straight Adaptor converts the Spectrum to the same expansion port as the ZX81 without any address conversion. 64K addresses obtainable when using the printer. EVE Adaptor, for 48K Spectrum, accesses ZX81 devices that work in 0-16K but does not work in systems with more than 48K. Adam Adaptor expands 16K Spectrum to 32K, using a ZX81 16K RAM Pack. The Adam II Adaptor, 16K Spectrum, uses 2 sets of peripherals at the same time. The 16K RAM pack gives extra memory up to 32K. Also any devices contained in 0-16K are moved to the 48K-64K area on the Spectrum. Battery backed RAMs, ports and EPROM programmers (not ZX81 EPROMs) can be used on the

Spectrum. RZ1 programmable tape controller for ZX81s and Spectrums uses no input/output address or RAM location. Each adaptor is £9 (incl. P&H), and the RZ1 is £20 (incl. P&H), 2nd relay control £5 extra. Stephen Adams 1 Leswin Rd., London N.16 7NL, 01-254 1869.

ZX Printer paper rolls now available in the U.S. This electrosensitive paper gives whiter background for contrast and legibility. Pack of 3, \$12 pp., E.Alvarez, P.O. Box 1025, Oviedo, FL 32765.

SYNTAX subscribers get a 15% discount on ZX/TS repairs and installations (2K RAM additions, keyboard beepers); users' groups members a 10% discount. Norris Radio and Electronics, 144 Terry Drive, Slidell, LA 70458. Send subscription notice or membership verification for discount.

Increase your programming memory and speed with ZXFORTH. On tape with manual, editor on tape with manual and keyboard overlay. \$60 plus \$5 (P&H), Artic Computing Ltd, 396 James Reckitt Ave., Hull, N. Humberside, UK HU8 OJA or \$30 Gladstone Electronics, 1585 Kenmore Ave., Buffalo, NY 14217.

Kopak Creations is the exclusive U.S. distributor of QSAVE. Kopak Creations, 448 W. 55th St., NY, NY 10019 for free catalog.

Contact ZX/TS users worldwide. SASE and 2 international reply coupons for details and a current copy of ZX Broadsheet. Nick Godwin 4 Hurkur Crescent, Eyemouth, Berwickshire, UK TD14 5AP.

As star captain rotate your ship left and right, encounter 2 types of meteors or enemy ships, gain thousands of points. Lost in Space on tape with manual requires 16K. \$11.95, M.C. Hoffman Co., P.O. Box 117, Oakland, NJ 07436.

NBA Picks predicts pro basketball point spreads and winners. Stuart Software, 25381-G Alicia Parkway, Suite 316, Laguna Hills, CA 92653, 714/770-4707.

CHECK accomodates 200 checks to 200 different names, modifiable to write 346 checks to 100 different names. Program has transaction entry and deposits, automatic date and check number, tells bank statement balance and indicates when it is running out of available memory. You can list items by date, number, name or outstanding items. \$10 check or MO, Dale Lipinski, 2737 Susquehanna Rd., Roslyn, PA 19001.

"The Watchmakers Guidebook to the TIMEX/Sinclair Computers" is a 44-page directory of suppliers, users' groups, ZX/TS-specific magazines and books, and index to ZX/TS articles appearing in general computer magazines and an intro to programming in BASIC. \$3.95 plus \$1 P&H, TSG Enterprises Guidebook, 54 Richwood Pl., Denville, NJ 07834.

Original Program of the Month Club offers a variety of cassette programs for \$5.95 or less. Limited ongoing purchase required. New members: 5 programs \$.99. SASE to The Original Program of the Month Club, 3763 W. Crocus Dr., Phoenix, AZ 85023.

QZX Newsletter, from the Sinclair Amateur Radio Users' Group is resurrected. New editor: Alex Burr, K5XY, Box 30, Physics Dept., New Mexico State University, Las Cruces, NM 88003.

Share games on a time-sharing computer network. You need a telephone modem to access GameMaster. GameMaster, 1723 Howard, Suite 219, Evanston, IL 60202.

New ZX/TS software: Vegas, Return from Space, Missile Launcher, Jeopardy, Demolisher, Air Attack, Sub-

marine, Guard the President. On tape, \$10.95 each. Combo Paks, 2 programs \$14.50. Intercomputer, P.O. Box 90, Prudential Center, Boston, MA 02199, 617/437-1190.

SYNTAX and SQ need authors. Send articles and programs to: Editor, SQ/SYNTAX Authors, RD 2 Box 457, Harvard, MA 01451. Please include self-addressed stamped envelope.

Eight hours of instruction and a TS1000 you can take home for \$145. The Cambridge and Boston Centers for Adult Education scheduled classes through March. Cambridge Center for Adult Education, Brattle St., Cambridge MA 02138, 617/547-6789 or Boston Center for Adult Education, 5 Commonwealth Ave., Boston, MA 02116, 617/2674430

Lamo-Lem will retail ZX/TS software under the name Simulusion nationally Jan. 1, 1983. They will continue mail order sales. New phone number: 619/263-6591. Simulusion, Box 894, Lemon Grove, CA 92045.

New U.S. source for ZX/TS books: Reston Publishing, c/o Prentice-Hall Inc., Book Distribution Cntr, Rte. 59 at Brook Hill Dr., West Nyack, NY 10995.

MB-1A5 Motherboard supplies computer power and gives +9 VDC at 5 Amps, +5 VDC regulated at 1.5 Amps, +16 VDC at 1 Amp and -16 VDC at 1 Amp. Fifty pin buss with eight 50 pin card edge sockets and Sinclair 46 pin bus with 6 card edge connectors. Two decoded 46 pin connectors let you use Sinclair memory modules to expand to 48K. \$109 pp without case. Use SMC-1632 Static Ram Memory Board with MB-1A5 50 pin buss. Has 16K or 32K of 200 ns 2Kx8 Static RAM decoded, assignable in 8K pages. Expand 16K to 32K with 16K chip set. 16K-\$99, 32K-\$159, 16K chip set \$65, all pp.. JACYN Electronics, PO Bx 570, Port Orchard, WA 98366, 206/871-1490.

SUPERPOSITION--8K

Waves of light, sound or water create disturbances in the medium they travel through. Their height (amplitude) affects the disturbance they create. When they meet at the same point in space, their amplitudes add. This process is called superposition.

This program models superposition by graphing two sinusoids, waves of constant wavelength and amplitude, and their combination.

You can specify the amplitude and frequency for each wave. The maximum amplitude of a single wave is 2 (this will fill the television screen). If you set the frequency at 1, you get one sine wave on the screen. The program then prompts for the same information for the second wave. If the frequency is three, you get three complete waves. The program prompts for the amplitude and frequency of the each wave in turn, then graphs the two waves on the screen. The program then waits for you to tell it to graph the superposition.

Since the greatest amplitude that can be shown is 2, the program checks for too large a sum. If the sum exceeds 2 the superposition is divided by a factor. At the end of the run, you are told the factor. You can avoid the subroutine that divides, just replace line 36 with PRINT " LESS THAN OR EQUAL TO 1".

To run SUPERPOSITION, enter the program listing, RUN and ENTER.

Allan P. Feldman, Philadelphia, PA

```

10 REM SUPERPOSITION
20 PRINT "SUPERPOSITION"
30 PRINT
35 PRINT "NOTE-AMPLITUDE MUST
BE"
36 PRINT " LESS THAN OR EQ
UAL TO 2"
40 DIM A(2)
50 DIM T(2)
60 DIM Y(63,2)
70 FOR I=1 TO 2
80 PRINT "WHAT IS THE AMPLITUDE
E"
82 PRINT "OF WAVE";I;"?"

```

```

85 INPUT A(I)
90 PRINT "WHAT IS THE FREQUENCY
Y"
92 PRINT "OF WAVE";I;"?"
95 INPUT T(I)
100 NEXT I
110 CLS
120 PRINT "SUPERPOSITION"
140 FOR I=1 TO 2
150 FOR X=1 TO 63
160 LET Y(X,I)=A(I)*SIN (T(I)*X
*PI/32)
170 PLOT X,22+10*Y(X,I)
180 NEXT X
190 NEXT I
200 PRINT AT 21,0;"PRESS ENTER
FOR SUPERPOSITION"
210 INPUT Z$
220 CLS
230 LET C=1
240 FAST
250 FOR X=1 TO 63
260 LET Y3=(Y(X,1)+Y(X,2))/C
270 IF Y3>2 THEN GOTO 500
280 PLOT X,22+10*Y3
290 NEXT X
300 IF C>1 THEN PRINT AT 21,0;"
AMPLITUDE DIVIDED BY ";C
310 STOP
320 LET C=C+1
330 CLS
340 GOTO 220
SYNTACTIC SUM: 44205, 8K/16K

```

EDITING HINTS FOR PRINT LINES

Set the cursor to the line you want to edit by ENTERing LIST and line number. Move the cursor in the line with shift 6 or shift 7.

Press shift 1 (EDIT) and the line moves to the bottom of the screen. Delete a line number with shift 0, put in the new line number and ENTER. (This method is helpful when your program contains many similar PRINT lines.) Hit shift 1 (EDIT) again and the line again displays at the bottom of the screen. When editing is complete, press ENTER and the new line is put in the program.

To center a print statement:

```

10 INPUT A$
20 PRINT AT 10,(31-LEN A$)/2;A$
$

```

To center multiple statements:

```

10 LET L=8
20 INPUT A$
30 LET C=(31-LEN A$)/2
40 PRINT AT L,C;A$
50 LET L=L-1
60 GOTO 20

```

W.C. Andrews, San Anselmo, CA

USERS' GROUPS

Check our latest list of ZX/TS users' groups to find one in your area. To check for a local group not listed, drop us a line (include SASE) or give us a call. SYNTAX, RD 2 Bx 457, Harvard, MA, 01451.

Anchorage, AK: Alaska Sinclair Users' Group, 5700 Cope St., Anchorage, AK 99502, 907/276-4139.

East Falmouth, MA: S.E. Mass. Computer Society, David Mitchell, 382 Locustfield Rd., East Falmouth, MA 02536, 617/548-2930.

Londonderry, NH: Sinclair Users' Group, Dick Cardner, Londonderry, NH 03053, 603/432-8060.

Miami, FL: Robert Terwilliger, 2932 S.W. 27th Ave., Miami, FL 33133, 305/443-6887.

Monterey, CA: Sinclair Monterey Users' Group, John Caylor, (new address) 698 Van Buren, Monterey, CA 93610, 415/839-7821.

Panama, Central America: ZX81/TS1000 Users' Group, John Nelson Jr., PSC Box 515, APO Miami 34004.

Pirmasens, W.Germany: M/SGT Gary M. Jartman, HHC, 197th Ordinance BN., APO NY 09189, (work) 2214-822/617, (home) 06394-5213.

Short Hills, NJ: Laura Bajor, 10 Marion, Short Hills, NJ 07078, 201/564-8021.

Vancouver, BC, Canada: Alan Wright, 470 Granville St., Suite 611, Vancouver, British Columbia, Canada V6C 1V5, 681-9531.

PROGRAM IMPROVEMENTS/REFINEMENTS

In Clark's Math Execution Time (Sept.82) he says it's faster to use $X*.5$ than $X/2$. It's true, but less accurate. $(X/2)-(X*.5)$ is

not zero but as large as $1E+28!$
Try it for $X=1E+38$.

Derek F. Stubbs, Vicksburg, MI

SYNTAX ERRORS: Ron Oblander sent this correction to Herb Cohen's Monthly Calendar Program (Sept.82). Line 350 should be:

```
350 LET NUM=INT (NUM+1.5)  
or the calendar will be off one day.
```

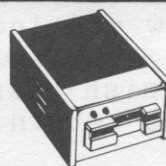
In Ron Miller's correction for "Black Box" in ZX81 BASIC Book review (Nov.82), line 250 should read:

```
250 PRINT AT 0,22;"WHAT NOW?";TAB 23;"=SHOOT";TAB 24;"=END"  
AB 23;"S";TAB 23;"=SHOOT";TAB 24;"=END"  
B 23;"G";TAB 23;"GUESS";TAB 24;"=END"
```

In Hex Math improvement (Oct. 82) and errors (Nov.82) the correction and improvements by Ron Miller should read:

```
520 LET D=INT (D/16)  
530 LET H(X)=(INT D-INT D*16)+2  
8
```

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517-687-7343

POKE: SMALL CHANGE FOR MACHINE LANGUAGE POKERS--8K/16K

We wrote up this small "monitor" during the debug phase of a more comprehensive PEEK and POKE utility. It is not small enough for the 2K machine--but I trust everyone is aware by now that few things are.

Load it into a 16K ZX/TS and you will be surprised how useful it is in your machine code experimentation. It's shortness is especially valuable if your code insists on bombing out, forcing you to repeatedly reload until you find the bug.

Turn on your ZX/TS and type: POKE 16389,112 ENTER. This will isolate the upper 4K of RAM starting from 28672 to the upper limit of 32767. Next, type: NEW followed by ENTER--this actually restructures BASIC's workspace so BASIC will ignore 28672 to 32767 unless you tell it to jump there by invoking the USR function.

After you type in the code and debug your typos, type: RUN ENTER--POKE will start running by printing: (28758)=0 and you will get the "L" prompt at the bottom of the screen. POKE is now waiting for your input. Follow all input with ENTER. When you finish your code, remember to insert a return command, decimal 201.

Menu for POKE:

An...n	Examine memory with new Address (0-65535)
STOP	Return to BASIC
n...n	Deposit value in current memory location (0 to 255)
R	Execute your machine code starting at memory address 28758
ENTER	Examine next memory location, do not deposit anything in current memory location.

Note: n is a digit from 0 to 9.

Comments on the Program:

- | | |
|------|--|
| 4 | Reason for choosing this number is tied up with the more comprehensive utility--you could pick up any location in the protected area from 28672 to 32767 |
| 50 | When we say STOP we mean shift A |
| 40 | If your input starts with an A you GOTO 100 |
| 100 | Interpret the string you inputted with a leading A to be the numerical string without the A |
| 1100 | This is where we leave BASIC and start executing your code which you POKE'd in starting at 28758. |

General Comments:

Read chapters 25 and 26 in the Timex Manual and note that before you return to BASIC the IY register must contain 30. (All numbers we discuss are DECIMAL.) The manual doesn't tell you that the INT line of the processor is being used--so don't enable the interrupt function (EI) because you will not be able to return to your machine code.

When you return from your machine code BASIC will interpret the value it finds in the BC register as a parameter you have passed to it. For example if you load the BC register with the value 1024 then you will print 1024 on the video screen--refer to line 1100 which establishes the BASIC variable B as containing the value you passed to BASIC in the BC register.

Here is a simple machine code demonstration program:

Address	Byte 1	2	3	Mnemonic
28758	1	0	4	LD BC, 1024
28761	201			RET

Deposit the preceding code in memory locations indicated and you will see the execution of your own machine code with parameter passed back to BASIC.

To enter more than one screenful of bytes add lines 6 SCROLL, 1103 SCROLL, and 1107 SCROLL.

Joseph L. Hartmann, Jersey City, NJ

```

4 LET A=28758
5 PRINT
10 PRINT "(";A;"")=";PEEK A;
30 INPUT A$
40 IF CODE A$=CODE "A" THEN GO
TO 100
50 IF CODE A$=CODE " STOP " TH
EN STOP
60 IF A$="" THEN GOTO 78
62 IF CODE A$=CODE "R" THEN GO
TO 1100
70 POKE A,VAL A$
75 PRINT TAB 14;VAL A$;
78 LET A=A+1
80 GOTO 5
100 LET A=VAL A$(2 TO )
105 PRINT
110 GOTO 5
1100 LET B=USR 28758
1102 PRINT
1105 PRINT B
1110 GOTO 5
SYNTACTIC SUM: 19030, 8K ROM

```

BOOK REVIEW

Title: Experiments in Artificial Intelligence
 Author: John Krutch
 Publisher: Howard W. Sams & Co.
 4300 West 62nd St.
 Indianapolis, IN 46268
 From: SYNTAX
 Price: \$8.95 plus \$2 (P&H)

Artificial intelligence, the forefront of computer science research, can be investigated on any computer. True, it is easier on a million-dollar system running LISP, but that doesn't mean that you can't taste AI on your ZX/TS.

Each chapter of Krutch's book deals with a different aspect of artificial intelligence: the concept itself, game playing, problem solving, computer-generated poetry and prose, and natural language processing. Although the programs listed in the book have limited applications, I found the ideas intriguing and many suggest possible extensions.

Programs in the book run on the TRS-80 but with some clever translation you can use all the programs on your ZX/TS. Appendix A explains TRS-80 specific keywords, but does not explain READ, DATA, and RESTORE, or any other BASIC keyword that your ZX/TS may not have. See David Lien's BASIC Handbook (reviewed SYNTAX Dec.82) for more info on ZX/TS keywords.

Each program follows very convenient structured programming techniques: many subroutines and a controlling main program made up almost entirely of GOSUBs. This makes programs easier to understand and modify, and provides good ideas for your own programs.

If you have 16K RAM, some time, and a facility in translating from other BASICs, you could learn a great deal from this book. AI for Small Computers should satiate anyone with a thirst for advanced computer software theory.--EO

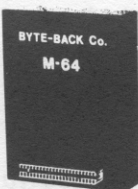
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CHECKS



SOFTWARE REVIEW

Program: 3D Monster Maze
Price: \$14.95
ROM/RAM required?: 8K/16K
Printed listings?: No
Program listable?: Yes
Challenge?: Excellent
Display?: Excellent
Written by: J.K. Greye Software
From: Melbourne House, Dept.
CS, 347 Reedwood Dr.,
Nashville, TN 37217

Still more proof that ZX/TS computers can do anything larger personal computers can do: 3D Monster Maze assaults you with amazing, lifelike 3D projections of a maze at eye level. You must escape from the maze before a Tyrannosaurus Rex attacks you.

You can only see straight ahead (although you can turn all the way around to look), and the walls fade off into the distance. You move with the 5, 7, and 8 keys (no backing up), and the program tells you when you hear the dinosaur. He advances whenever he likes; the program doesn't stop at every move. If he catches up to you, you can outrun him, but chances are you won't have time to turn around, and if you run into a dead end, you're dead. You can repeat moves by holding keys.

Monster Maze uses machine code and its full-screen display keeps up perfectly with your moves. In fact, it has a timing loop which sets the speed from 0 to 9. Set at 5 (as it comes on tape), the maze is a challenge: I eluded the dinosaur three mazes in a row, then got caught. Set at 0, the game is close to impossible, as "Rex" is on top of you before you get a chance to look around!

Watching the hungry dinosaur run up the halls of the maze after you (lunch) is a real motivator. The adrenalin builds in your blood as you frantically try to escape! A great fast action game.--EO

HARDWARE REVIEW

Product: Buffered Buss/Development Board "Expansion Board"
From: Computer Continuum
301 16 Ave.
San Francisco, CA 94118
Price: \$40 bare board/\$70 kit

Computer Continuum's buffered expansion board kit is a buffered backplane, providing four 44-pin edge card connectors with the same pinout as Sinclair's except the slot. (Cards to fit these connectors are available from RS).

All required parts come with the kit and it's well designed and versatile. The buffering system for the address lines is straightforward and assembly is easy.

However, buffering the bi-directional data bus is confusing. You must install jumpers to make the 8 to 16K area accessible (by decoding the address lines). This area, not used in the ZX/TS, is used for memory mapping by the expansion board. I installed the recommended jumpers printed on the circuit board, making 12-16K accessible for input and output.

No explicit instructions were given for using the Memotech 64K memory pack. A phone call to Computer Continuum disclosed that it has to be installed between the ZX/TS and the expansion board. If you have 64K memory, make sure the memory between 12 and 16K is disabled to prevent damage.

Four 44-pin sockets are supplied, and coupled with standard Radio Shack plug-in PC boards, provide ample area for the hobbyist to develop hardware interfaces. I designed and built a printer interface, 110 VAC circuit control, and a sound generation board.

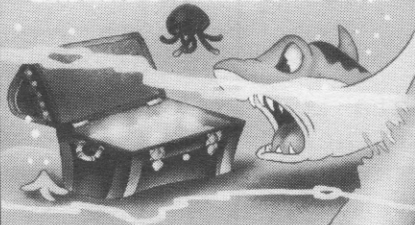
Computer Continuum's hardware expansion board represents an excellent buy for expanding the ZX/TS beyond a game computer.

Lewis Duffing, Warren MI

2K GAMES PACK

• MONSTER MASHER
• STAR BLASTER
• DRAGON SLAYER
• COPTER PATROL
• KILLER WHALE
• ASTRO WALK

SHANN'S TREASURE 16K



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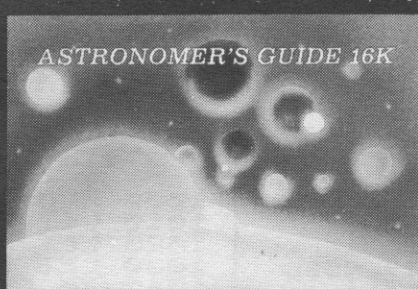


PROGRAMMERS TOOLKIT 16K

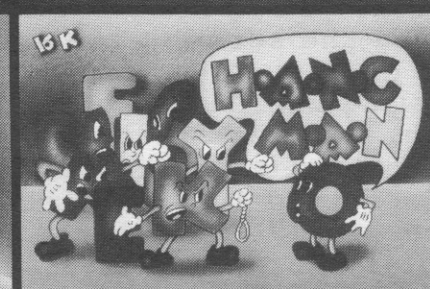


Programmers Toolkit & Graphics Kit Are Compatible

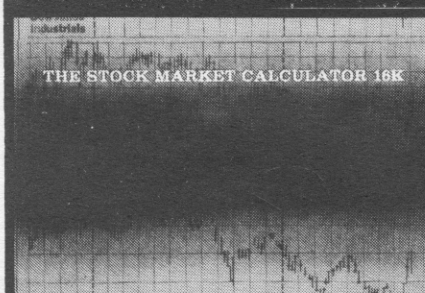
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TAMING OUTPUT

Your ZX/TS prints out data to many decimal places, most of them extraneous. The number's awkward length and changeable format make it hard to design a neat, compact output display. To fix this, you can format data in several ways before you print it out.

Round/Truncate: To truncate any number A to n decimal places and round the last digit,

```
LET A=INT((A+.5/1En)*1En)/1En
```

before printing. Substitute the number of decimal places you want for n in this statement (for example, 1E3 for 3 decimal places).

Exponential Format: Your ZX/TS doesn't revert to exponential notation unless a number is greater than 10^{13} or less than 10^{-5} . In between, you spend a lot of time tapping the screen with a pencil to count digits. Sending A to the following subroutine produces a string, A\$, that is truncated and rounded to n significant figures, and formatted to a predictable length of n+7 characters. (For example: for n=3, -17.566019 goes to -0.176E+02.) Insert a value for n in place of 3 in line 1070 and LEN A\$>n+3 in line 1130.

Fixed Point, Commas: Multibillionaires like to see their dollars spelled out, with commas between every 3 digits. They also like numbers stacked in columns with the decimal points and commas aligned. The following rather bulky subroutine accomplishes this. First, enter LET N1=... early in the calling program (or in the immediate mode), defining N1 to be the column number where decimal points fall. The subroutine converts any number A into the string A\$ (for example, 9,422), and specifies N2, the column number for the first character of A\$. PRINT AT XX,N2;A\$ statements align decimals and commas of successive output numbers.

This subroutine works for all numbers except negative exponents. Presumably you wouldn't use this notation for small numbers. You could incorporate the decimal truncation statement given in paragraph two into line 1030 of this subroutine to eliminate, for example, fractions of a cent.

John A. Wood, Cambridge, MA

```
1000 REM --EXPONENTIAL FORMAT---
1010 IF A<>0 THEN GOTO 1050
1020 LET C=0
1030 LET E=0
1040 GOTO 1080
1050 LET B=LN ABS A/2.3025851
1060 LET C=INT B+1
1070 LET E=INT ((10**((B-C)+.5/1E3))*1E3)/1E3
1080 LET F$=STR$ ABS C
1090 IF LEN F$=1 THEN LET F$="0"
1100 LET G$="+"
1110 IF SIGN C=-1 THEN LET G$="-"
1120 LET A$=STR$ E
1130 IF LEN A$>=5 THEN GOTO 1160
1140 LET A$=A$+" "
1150 GOTO 1130
1160 LET A$=A$+"E"+G$+F$
1170 IF A>=0 THEN GOTO 1200
1180 LET A$="-"+A$
1190 RETURN
1200 LET A$=" "+A$
1210 RETURN
SYNTACTIC SUM: 27625, BK/1K
```

```
1000 REM --FIXED POINT, COMMAS--
1010 LET A$=""
1020 LET E$=""
1030 LET B=ABS A
1040 IF B=0 OR B>1E13 THEN GOTO 1110
1050 IF B>=0.1 THEN GOTO 1090
1060 LET E$=STR$ B
1070 LET A$="0"
1080 GOTO 1230
1090 LET C$=STR$ B
1100 LET E$=C$(LEN STR$ INT B+1 TO LEN C$)
1110 LET C$=STR$ INT B
1120 IF B<1E13 THEN GOTO 1160
1130 LET A$="000"+A$
1140 LET B=B/1000
1150 GOTO 1110
1160 LET I=LEN C$-2
1170 IF I<1 THEN LET I=1
1180 IF I=1 THEN GOTO 1220
1190 LET A$="."+C$(I TO LEN C$)
1200 LET C$=C$(1 TO LEN C$-3)
1210 GOTO 1160
1220 LET A$=C$+A$
1230 IF A>=0 THEN GOTO 1250
1240 LET A$="-"+A$
1250 LET N2=N1-LEN A$+1
1260 LET A$=A$+E$
1270 IF N2>=0 THEN RETURN
1280 LET N2=N2+32
1290 GOTO 1270
SYNTACTIC SUM: 38662, BK/1K
```


MC PROGRAMMING #12: CALLING AND RETURNING

[This completes the series on machine language programming for the ZX80. The information in this column works equally well on the ZX81 and TS1000.--EO]

LET A=USR(16427) [16514 for 8K ROM] says "GOSUB machine code routine starting at address 16427." After the subroutine finishes, control returns to BASIC (unless you forget a RETURN instruction).

Inside the subroutine, however, you can use several instructions for each CALLing and RETURNing--one "unconditional" ("Do It!") and eight "conditional" ("Do it only if x"). Flags hold true-false conditions that may be tested.

For example, if your subroutine completes only if A=0, then use a RET Z instruction, which returns only if Z flag is set (1; True). RET NC returns only if the Carry flag is not set (0; False), and

therefore continues without returning if the Carry Flag is set.

CALL instructions work the same way. For example, if your subroutine calls math routines in ROM under certain circumstances (A=9, BC>90, etc.), then test a register with a CP (compare) instruction and CALL Z. The CP instruction sets the Z flag True if A equals the number compared.

Be careful! Not all instructions set the flags as you might expect. For instance, LD A,0 does not affect the Z flag. Z-80 manuals list which instructions affect which flags.

Together, CALLs and RETURNs can test flags for:

Zero or Nonzero (Z/NZ)
Carry or No carry (C/NC)
Parity Odd or Even (PO/PE)
Plus or Minus (P/M)

Jon Bobst, Zeta Software, P.O. Box 3522, Greenville, SC 29608-3522

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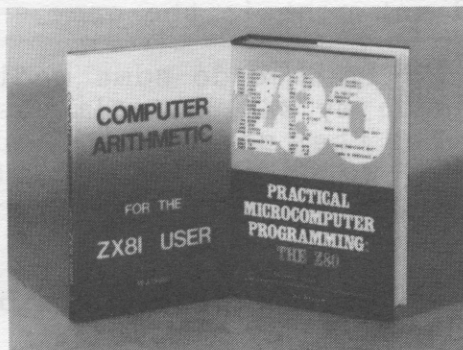
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DEAR EDITOR

Saving programs on cassette from my ZX81 gives a buzzing sound at the beginning and end of my programs. This caused problems when reloading programs. Can I eliminate this buzzing sound?

Ho Tiap Fen,
Bandar Seri Begawan, Brunei

Ground-loop interference causes this problem. Unplug the EAR cable during saving and the MIC cable during loading. Also, use short tapes--C-30 maximum. Longer tapes can't be pulled smoothly.--EO

Last March I bought a ZX81 kit and 650 mA power supply. This Oct., I purchased a 16K RAM pack. I can't SAVE/LOAD a program because of the hum during the 7-sec. silent portion. Also, when using the 16K RAM, the screen fills with scrolling horizontal bars 15 minutes later. When I SAVE or LOAD in 1K, everything works fine--no hum, no bars. Does this indicate a defective RAM or power pack?

William Mitchell, Ontario, Canada

Sinclair RAM packs contain a power converter to get the voltages needed to drive their chips. This sometimes puts transients on the power for the ZX/TS, and can cause loading and saving problems. Put noise suppression on the 9V supplies in the RAM, or get a new RAM pack. Fuzzy horizontal bars on the screen indicate power supply overload, perhaps from the RAM pack power converter. Memotech RAMs typically do not show these problems, because they do not have a power converter.--EO

Like many Sinclair users, I dislike using the difficult flat membrane keyboard and various overlays for the keyboard are not any more promising. I decided to add

my own typewriter style keyboard but the only way to connect it was to force a 13 conductor wire between the two halves of the case.

Can I connect a keyboard through the output port in the rear of the ZX81 and does it require additional hardware?

Lance Fong, Oakland, CA

Connecting a keyboard through the back edge connector needs more than just wires. Memotech's keyboard will connect this way. Until then, use flat 13-conductor ribbon cable and run it out the slot used by the membrane keyboard or between the case halves.--EO

Is there any way to get COBOL on the ZX/TS computer?

Here's a tip for ZX80 owners who want to adapt ZX81 adventure games. Change LET V\$=INKEY\$ instructions to INPUT V\$ and delete the IF statement that checks for "" (i.e., IF V\$="" THEN...). Then hit ENTER after each entry.

Noel Pepin, Quebec, Canada

No COBOL for ZX/TS yet.--EO

It seems that machine code programs begin on line 1 (REM 1). How, then, do you SAVE them, since the program is not "named"?

Max R. de Arellano, Santurce, PR

Specify program name after the SAVE command, i.e., SAVE "NAME". Line 1 need not contain the name.--EO

I'd like to do some modifications on my ZX81 but I'm unsure whether they can be done and if they're worth the time or effort.

First, internal memory expansion. I understand you can increase the present 1K to 2K RAM. With a little effort, possibly more can be added by stacking or ribbon-connecting from the 2K socket to an

unlimited RAM board. Past SYNTAX articles mentioned that external RAM packs bypass or cutoff the internal RAM units. Is it possible to connect the internal and external RAMs to create more memory space? If so, I could plug an external 16K RAM into an internal 16K RAM to equal 32K only when I needed it.

Second, I see by ads and bulletins that EPROMs can be used with ZX81s. How can I interface either an internal or external EPROM socket and what is needed to facilitate faster and easier programming?

Rex Ward, Upper Darby, PA

Adding RAM inside the ZX/TS probably costs more than buying a RAM pack. But, some people remap their 1K or 2K internal static RAM to the 8K-16K area. EPROMS are easy to use and complete circuit diagrams and boards for burner and read cards will appear in SQ 2/83.--EO

Here's a low-tech solution to ZX/TS overheating. Do what the mainframe computer operators do--refrigerate the computer. Buy one or two "blue ice" packets that are sold in markets and keep them in your freezer. When you are ready to set up operation, wrap them in a plastic bag and place them under the computer, then plug it in.

This method successfully eliminated heating problems for me. I've used it for up to 10 hours of continuous operation with the 16K RAM attached. There must be other users like me unwilling to void their warranties by opening the case to perform a more permanent fix of the problem.

Does anyone have a low-tech solution to the loose-connector problem? There are many of us out here who lack confidence in our skill especially with soldering irons and wiring diagrams.

Jim Giddings, Providence, RI

Here's a couple of suggestions to help you correct your loose connector problems: try taping your RAM pack on or put Velcro on the front of the RAM pack and the back of your ZX/TS computer.--EO

I would like to clarify and comment on the VOTEM hardware review (Oct.82).

With the machine language routine supplied, VOTEM can sample analog data at a rate of about 1Hz with a resolution of roughly 1 in 2000. Since VOTEM uses a voltage-to-frequency conversion technique, there is a trade-off between sampling rate and resolution. Changing two bytes in the machine language routine decreases the conversion time at the expense of resolution. Decreasing the conversion time to 50 ms still yields approximately 10-bit (1 in 1024) resolution. Compared to other techniques, this method is slow, but is fast enough for many applications and offers easy interfacing and low cost.

I am not sure I understand the reviewer's fear of software calibration. It is actually required for high accuracy and precision.

VOTEM's jack arrangement can be confusing. The diagram in the manual does not clearly illustrate the best way. But, there is a neat arrangement, using the dual cable supplied with the computer and the single cable supplied with VOTEM. We intend to change the manual in the next edition.

Finally, I don't understand how VOTEM can cause television interference. The highest frequency generated is under 30KHz unless higher harmonics or Fourier components are also present. Still, all of the cables are shielded, or should be. We are interested in hearing from users experiencing problems with VOTEM.

Alger Salt
Down East Computers
PO Box 3096, Greenville, NC 27834

MERRY CHRISTMAS--8K/16K

To run this Christmas display program, enter the program in the FAST mode, then return to the SLOW mode and RUN. To exit, hit BREAK.

You can personalize your messages by changing lines 40, 110 and 125. To add additional text, insert in pairs between lines 100 and 129 the following lines:

101 PRINT AT 10,12;" 9 characters of text"

102 PAUSE 120

Have a Merry Christmas!

Mark C. Freitas, Chelsea, MI

```

1 REM MERRY CHRISTMAS BY M.FR
2 EITAS 1981, REVISED 1982
3 LET T$="X"
4 LET Y=16
5 CLS
10 GOSUB 60
20 LET A$=""
30 PRINT A$
40 PRINT " HAVE A
50 PRINT A$
55 GOSUB 60
57 GOTO 100
60 FOR I=1 TO 9
70 PRINT "
80 NEXT I
90 RETURN
100 PAUSE 120
110 PRINT AT 10,12;" MERRY"
115 PAUSE 120
120 PRINT AT 10,12;"CHRISTMAS"
125 PAUSE 120
129 FOR S=1 TO 32
130 SCROLL
131 NEXT S
140 PRINT AT 2,19;"::";AT 3,20;
"Y";AT 4,9;"E";AT 4,20;"L";
150 PRINT AT 5,4;"O"
160 PRINT AT 6,4;"
160 PRINT AT 7,5;"
170 PRINT AT 8,5;"
170 PRINT AT 9,4;"
180 FOR I=1 TO 8
189 FOR B=1 TO 4
190 PRINT AT 8,17;" I I ";
191 NEXT B
194 FOR B=1 TO 6
195 PRINT AT 8,17;" . . . "
196 NEXT B
200 NEXT I
210 PRINT AT 13,4;"HERE COMES S
ANTA CLAUS"
220 FOR I=1 TO 3
230 GOSUB 2000
240 NEXT I
245 PRINT AT 13,4;" HERE COMES
ANTA CLAUS"
250 FOR I=1 TO 3
260 GOSUB 2000

```

```

270 NEXT I
280 PRINT AT 13,4;" RIGHT DOWN
SANTA CLAUS LANE"
285 FOR B=1 TO 100
290 GOSUB 2000
295 NEXT B
300 PRINT AT 13,4;"VIXEN AND BL
ITZEN
310 PRINT AT 14,7;" AND ALL HIE
REINDEER"
315 FOR I=1 TO 5
316 GOSUB 2000
320 NEXT I
321 PRINT AT 15,12;"PULLING ON
THE REINS"
322 FOR B=1 TO 17
323 SCROLL
324 NEXT B
325 PRINT AT 19,16;"*"
330 PRINT AT 20,16;"X"
335 FOR I=1 TO 8
340 LET T$=T$+"XX"
350 LET Y=Y-1
360 PRINT AT 21,Y;T$
370 SCROLL
380 PRINT AT 21,Y;T$
390 SCROLL
400 NEXT I
420 FOR I=1 TO 3
430 PRINT AT 21,15;"III"
435 SCROLL
440 NEXT I
445 PRINT " MERRY CHRIS
TMAS"
450 PAUSE 400
455 FAST
465 CLS
470 LET A$="CHRISTMAS"
480 FOR I=1 TO 29
500 PRINT A$;A$;
510 NEXT I
520 PRINT "
540 SLOW
550 FOR N=1 TO 13
560 PRINT AT N,7;" "
570 NEXT N
580 PRINT AT 12,1;" "
13,2;" "
11,1;" "
590 FOR L=1 TO 2
600 PRINT AT L,12;" "
610 NEXT L
620 FOR B=3 TO 11
630 PRINT AT B,11;" "
640 NEXT B
650 FOR I=11 TO 13
660 PRINT AT I,12;" "
670 NEXT I
680 FOR I=1 TO 3
690 PRINT AT I,19+I;" "
700 NEXT I
710 FOR I=4 TO 13
720 PRINT AT I,23;" "
730 NEXT I
740 PAUSE 1000
744 FOR B=1 TO 22
745 SCROLL
746 NEXT B
750 RUN
1999 STOP
2000 FOR B=1 TO 3
2010 PRINT AT 8,17;" I I "
2020 NEXT B
2030 FOR B=1 TO 5
2040 PRINT AT 8,17;" . . . "
2050 NEXT B

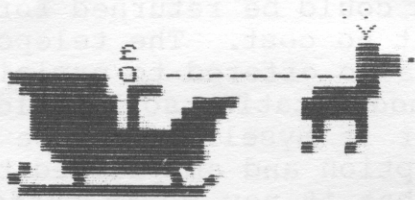
```



```

9999 RETURN
9999 SAVE "X-MAS"
9999 GOTO 9999
SYNTACTIC SUM: 17460, 8K ROM

```



HOME ENERGY ANALYSIS--4K/1K, 8K/2K

Using your heating costs, the amount of fuel you use, and daily temperature can help you figure how to efficiently heat your home in the winter or keep it cool in the summer. This program takes into account the effectiveness of both heating and cooling systems and other factors affecting energy usage in your home (i.e. location of thermostat, amount of insulation). This program does not use DOE standards.

Run Home Energy Analysis on either a 4K ZX80 with 1K RAM or an 8K machine with greater than 1K RAM. To use, type the listing and insert numbers in line 250 and 260 calculated from your recent utility bills (we entered 500 in these lines as an example--Ed). Line 250 should be the average electric usage from several recent non-air conditioning months and line 260 should be fuel usage from the most recent non-heating months averaged. Update these numbers to broaden your information base and keep it current. If you use a 4K ROM, enter dollars as cents. For example, enter \$1.00 as 100.

Jim Holder, Huntsville, AL

```

10 LET L$=""
20 CLS
30 PRINT
40 PRINT "***** HOME ENERGY AN
ALYSIS*****"
50 PRINT
60 IF L$="A" OR L$="H" THEN GO
TO 100

```

```

70 PRINT "CHOOSE ONE; A-AIR CO
ND, H-HEAT"
80 INPUT L$
90 GOTO 20
100 PRINT "MONTH? (ABBREVIATE)
"
110 INPUT K$
120 PRINT K$
130 PRINT "COST? ";
140 INPUT X
150 PRINT X
160 PRINT "UNITS USED? ";
170 INPUT Y
180 PRINT Y
190 PRINT "DEGREES DAYS? ";
200 INPUT Z
210 PRINT Z
220 PRINT
230 LET A=X/Y
240 PRINT "COST PER UNIT ";A
250 IF L$="A" THEN LET Y=Y-500
260 IF L$="H" THEN LET Y=Y-500
270 LET D=A*Y
280 PRINT K$;" COMFORT ENERGY C
OST ";D
290 LET B=D/Z
300 PRINT "COST PER DEGREE DAY
";B
310 LET C=Y/Z
320 PRINT "EFFICIENCY RATING ";
C
330 PRINT
340 PRINT "ENTER 1 TO CONTINUE,
2 TO STOP"
350 INPUT K
360 IF K=1 THEN RUN
SYNTACTIC SUM: 33067, 8K/1K

```



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Byte-Back's M-16, like its Sinclair counterpart, is a small black box that plugs directly into edge connector in back of the ZX81 or TS1000 computer to provide 16K RAM memory.

I made several comparisons with Sinclair's 16K RAM pack. First, M-16's overall proportions are larger (4 3/4" x 3 3/4" x 1"). M-16's internal lay-out is not Sinclair's "folded over" configuration, giving a less compact unit.

In spite of M-16's additional height, it is more securely attached. After 4 months, I have yet to experience system crashes because of poor connection between computer and memory pack.

Byte-Back designed their 16K RAMs with open edge connectors to let you stack up to 3 units in series, giving up to 48K memory. According to their literature and schematics, slight differences exist in strapping second and third units--specify this information if you order additional units. If you already own Sinclair's 16K RAM, you can expand to 32K or 48K using Byte-Back's unit (or units).

I can't speak for Byte-Back's service record, but I can praise their recognition that most of their customers work on their kits at night. With this in mind, someone staffs the phones at all times.

Everything works fine in BASIC whether in FAST or SLOW modes. The computer also runs in assembly language in FAST mode. The system did crash when I tried to run an assembly operation in SLOW mode.

I called Byte-Back at 11:00pm on a Saturday and believe it or not, I spoke with someone who gave me quick, informative advice. Some earlier units with SLOW mode problems could be returned for repair at no cost. The telephone advisor also offered to explain the simple modification so I could try to repair it myself. I chose the latter option and am pleased to report that it now works perfectly.

I left my ZX81 and attached M-16 plugged in for several days at a time with no overheating problems. It uses the original Sinclair ZX81 power supply.

Completely satisfied with Byte-Back's product, I give them high recommendations. Their 90-day warranty (even on kits), their economical price and the expertise of their telephone assistants make them an excellent company to do business with.

Craig Harris, Seattle WA

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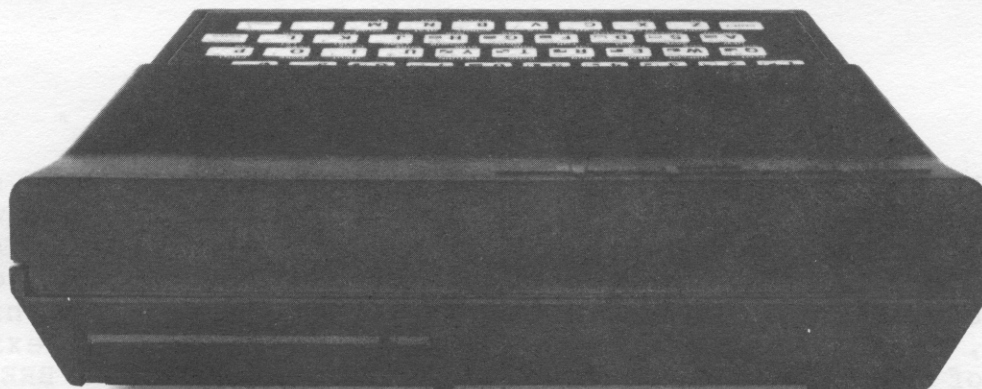
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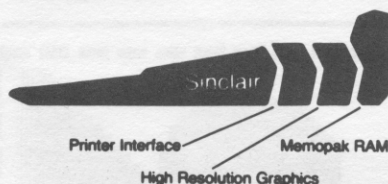
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ZX81 CALCULATOR

To get quick answers to math problems on your ZX81 just ask it to PRINT whatever the problem is. For example, PRINT 6+2 gives you 8 at the top of the screen. PRINT is only one keystroke, but there is a more efficient way.

This short program will convert the ZX81 into a sophisticated calculator with chaining capabilities.

```
100 INPUT L
110 SCROLL
120 PRINT L
130 GOTO 100
```

To start the program, RUN or GOTO 100. The computer waits for you to enter a math problem. Because the ZX/TS accepts any expression, no matter how complicated, for L all you have to do is key in the desired expression and push ENTER. Thus, SQR 2 (square root) gives you 1.4142136 at the bottom of the screen.

Line 110 has two purposes. One

is to insure that a long calculating session does not end with an error report of 5 (no more room on the screen). The break key does not affect the program while it is waiting for input. To exit--hit any number, ENTER and BREAK.

To use the previous answer in further calculations remember that the computer has identified it with L. Thus to divide by 2, just enter L/2 and 0.70710678 appears.

This short program places the ZX81 in the true calculator mode and makes it easier to get answers to nonrepetitive problems.

If you want your input recorded on the screen, use this program:

```
100 INPUT L$
110 LET L=VAL L$
120 SCROLL
130 PRINT L$
140 SCROLL
150 PRINT " ";L
160 GOTO 100
```

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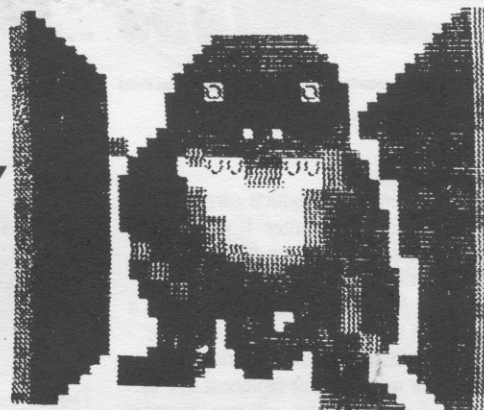
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EPROMS--WHAT THEY ARE, WHAT THEY DO

EPROM stands for Erasable Programmable Read Only Memory. It stores bytes permanently in the same way that RAM stores bytes with power on. Putting bytes into an EPROM requires a difficult-to-build EPROM burner; erasing EPROMs requires an expensive EPROM eraser light. You can, however, easily read bytes out of an EPROM; it requires little interfacing.

We classify EPROMs like other memory chips, by memory capacity and number of bits of data output. ZX/TS machines have an 8Kx8 bit ROM. The most common EPROM, the 2716, is 2Kx8 bits, or 2K bytes.

New EPROMs come with all their data bits set to 1 (therefore each byte is set to 255). To program an EPROM, we apply a high voltage to the programming pin (usually marked Vpp), present the data at the data outputs, and pulse the appropriate chip select pin. Because the pulse must be long during programming, the process takes about 0.1 second per byte. This burns through the linkages that represent ones in the EPROM, resulting in zeroes. For this reason when we program an EPROM we sometimes say we burn it.

To erase an EPROM, just expose the chip inside to ultraviolet light through the transparent lid on the package. It takes about half an hour to erase an EPROM, depending on the lamp intensity and the distance between the lamp and the chip. Erasure sets all the data bits in the EPROM to ones.

Tri-state outputs on most EPROMs simplify interfacing them as Read Only Memory. When an address decoder selects the chip, the outputs come alive and supply information to the computer. At all other times, the outputs are effectively disconnected.

We will publish complete EPROM burner and read card plans in SQ Spring 1983, as the second part of **Build a Printer Interface and EPROM**

Programmer. These circuits use 2716 EPROMs, which cost about \$5 each. The 2716 differs from its predecessors in how you burn it and the power supply voltages you need. Earlier EPROMs required complicated programming cycles to avoid overburning the chip. The 2716 requires only the simple burning technique described previously, and runs on a single 5-volt supply. Texas Instruments sells the 2716 under the number TMS2516. Texas Instrument's TMS2716 differs substantially from other 2716s.

Most EPROM applications involve storing commonly used machine code programs permanently, so that you can use them without loading from tape. You can simulate instant loading by copying all 2K out of an EPROM into the main memory of a 2K TS1000 (or move 1K of EPROM into the 1K of a ZX81). Or, if you can convince the ZX/TS to RUN the BASIC code, you can simply store your favorite BASIC programs in EPROM.

EPROMs can translate one set of codes to another, for instance, changing ZX/TS codes to ASCII and back. You could use a single 2716 EPROM with address lines 0-7 as the input, address line 8 selecting ASCII to ZX/TS (or vice versa) and data lines 0-7 outputting translated code in a RS-232 board to interface to most other computers.

In ZX/TS machines, EPROMs can store alternate character sets. You could program an EPROM in the same format as 1E00-1FFF in the 8K ROM, and wire the EPROM **inside** the computer in parallel with the existing ROM (but with extra decoding so it will map above 2000). Then with a machine language routine to set the I register to 20, your ZX/TS will use the character set in the EPROM instead of the one in the original 8K ROM.

Some machines use EPROMs as memory map decoders. If programmed with the proper matrix, an EPROM becomes a powerful chip to translate any combination of 11 bits to

any combination of 8. This can be used to select memory, tape, keyboard, disk drive, and four other memory-mapped devices exactly within a 2K block of memory.

With a 25V power supply controllable with a TTL level, you can build a non-volatile data logger using 2716s by putting the EPROM in program mode for each measurement and powering down the EPROM in between measurements. Use this method when you need a permanent record of events that happen over a long period of time--like a voltage every 10 minutes for a week.

Electrically, EPROMs also offer great advantage. They consume little current: 2716s draw just 60 milliamps when operating, 10 mA when in standby (or "power-down") mode. Because they can be run in standby mode when not being addressed and you would typically address only one 2716 at a time, nK of memory consumes only $60+5*(n-2)$ milliamps of current.

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